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PECTOLITE PSEUDOMORPHOUS AFTER QUARTZ FROM WEST PATERSON, N. J.

MILTIADES L. GLENN
Erie, Pa.

MOST collections of minerals from the trap-rock quarries in the vicinity of Paterson include specimens labeled "quartz pseudomorphous after pectolite" altho in the last few years considerable doubt has been cast upon the correctness of this labeling, anhydrite and glauberite rather than pectolite being now regarded as the original mineral in most cases. In the present note an instance of the opposite replacement, namely, pectolite pseudomorphous after quartz, is described. It is hoped that the interpretation of the material in this case will be more permanent. Similar specimens may have been found in the Paterson region before. Thus, in the F. A. Canfield collection there is, as noted by Mr. A. C. Bates,[1] "a fine specimen of well-formed quartz crystals turned into pectolite." Dr. Fenner, in his paper on the Watchung basalt and the paragenesis of its zeolites[2] mentions on page 135 and again on page 157 partial replacement of quartz by pectolite, but this occurred presumably only on a microscopic scale. None of the other books or articles available to the writer refers to such an occurrence, and it has therefore seemed worth while to bring it to the attention of mineralogists.

While collecting at McKiernan and Bergin's quarry in the summer of 1915 the writer found a mass of typical pectolite, imbedded in which there was visible what seemed to be the tip of a small quartz crystal coated with pectolite. On breaking up the specimen some months later a group of these crystals measuring 2 x 2 inches was detached; the separate crystals are about $\frac{3}{8}$ inch in diameter. This is illustrated in Figure 1. Where the crystals were broken across they proved to consist, not of quartz coated with some other mineral, but of a compact-fibrous material entirely occupying the apparent crystals of quartz. One proved to be hollow, the fibrous mineral forming a mere shell.

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[1] *Mineral Collector,* **15,** 162, 1909. Mr. Canfield writes that the specimen referred to, and several others, were collected in 1907.

[2] *Ann. N. Y. Acad. Sci.* **20** (2), pt. II, 93–187, 1910.

That the external form of these crystals is that of quartz was proved by measurement of the angles with a contact goniometer: the angle between the rhombohedron and prism of the same order is 38° and between two faces of the former 46°, which correspond within half a degree to the equivalent angles of quartz. The two rhombohedrons are about equally developed, and the crystals are short prismatic in habit as is frequent in the quartz of the Paterson region.

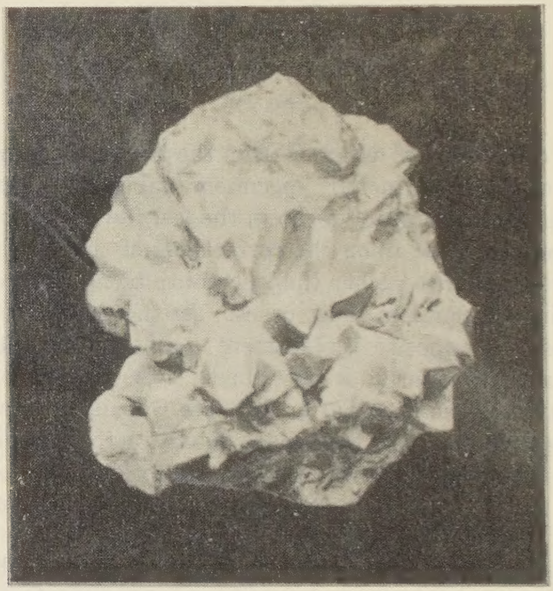

Photo. by S. G. Gordon.
FIGURE 1.—PECTOLITE PSEUDO. QUARTZ, WEST PATERSON, N. J.

With the idea that optical study might indicate the nature of the mineral replacing the quartz, a sample was submitted to Dr. Wherry of the National Museum, and he reported as follows:

"The mineral is compact-fibrous and essentially homogeneous;

its indices of refraction are $\alpha = 1.59 - 1.60$ and $\gamma = 1.62 - 1.63$, the double refraction being around 0.03, and the extinction is straight with the direction of elongation optically + ; it therefore agrees optically with pectolite, except that the indices are rather low." The low indices are due to the high water content.

The inference that the material represents a pseudomorph of pectolite after quartz seemed worth establishing still further, so a chemical investigation of it was undertaken. It proved to give the usual reactions of pectolite, fusing quietly at 3 with a yellow flame and dissolving in HCl with imperfect gelatinization. Quantitative analysis yielded the results presented in the first column of Table 1 below.

TABLE 1.

	1	2	3
H_2O	3.77	4.09	2.70
Na_2O	7.45	8.57	9.31
CaO	32.63	32.21	33.68
MgO	2.35	1.43	....
$Al_2O_3+Fe_2O_3$	0.52	0.58	....
SiO_2	53.42	53.94	54.31
	100.14	100.82	100.00

1. Analysis of pectolite pseudomorphous after quartz from West Paterson, N. J., by the writer.
2. Analysis of massive pectolite from Point Barrow, Alaska[1], introduced for comparison; these two specimens are certainly very similar in composition.
3. Theoretical composition of pectolite, $HNaCa_2 (SiO_3)^3$.

These results show that pectolite is indeed represented.

DURDENITE FROM CALIFORNIA[2]

ESPER S. LARSEN
U. S. Geological Survey

THE rare hydrous ferric tellurite, durdenite, has been described only from the original locality, Honduras. However, in examining specimens of tellurium ores in the collections of the University of California for tellurite, the author found a specimen, labeled "Calaveras County, Cal.," which contained along the fracture surfaces pale greenish yellow spherulites, which an optical examination proved to be durdenite. The following table gives the optical properties of durdenite from the original locality (also in University of California Museum) and from California and shows their identity.

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[1] F. W. Clarke, *Am. J. Sci.* [3], **28**, 20, 1884.

[2] Published with permission of the Director of the U. S. Geological Survey.

TABLE 1. THE OPTICAL PROPERTIES OF THE TWO DURDENITES

	Honduras	Calaveras County, Cal.
Optical character	Negative	Negative
2 E_{na}	44° ± 3°	48° ± 3°
2 V_{na}	22° ± 2°	24° ± 2°
Dispersion	$\rho > v$ very strong	$\rho > v$ very strong
Optical orientation	X ⊥ perfect cleavage. Cleavages are rhombic in outline with 72° angle; Z bisects obtuse angles	X ⊥ cleavage
α	1.702 ± 0.005	1.710 ± 0.005
β	1.955 ± 0.005	1.94 ± 0.01
γ	1.965 ± 0.005	1.95 ± 0.01
Pleochroism	X Nearly colorless Y Pale greenish yellow Z Rather pale sulfur yellow	Faintly pleochroic

AZURITE FROM TSUMEB, AMBO-LAND, SOUTH-WEST AFRICA

ELLIS THOMSON
University of Toronto

Azurite crystals from this locality have already been described[1] but, as two new forms were discovered on the crystals measured by the author, it was thought that a brief description of the same might be of some interest.

The crystals used were obtained from the Heidelberger Mineralien Comptoir (Fr. Rodrian), Heidelberg, Germany. They are for the most part small and tabular in habit, the largest faces in

[1] Z. *Kryst. Min.*, **52,** 225, 1913.

nearly every case being the orthopinacoids. The crystals are translucent, dark azure blue in color, and have a brilliant luster. The reflections from the crystal faces were mostly distinct, only about one-third of them showing multiple images.

Four crystals were measured in all, showing the following forms, the new ones being indicated by *:

$c = 0(001)$, $a = \infty 0(100)$, $m = \infty(110)$, $w = \infty 2(120)$, $1 = 0\frac{2}{3}(023)$, $f = 01(011)$, $p = 02(021)$, $\sigma = 10(101)$, $\Phi = 20(201)$, $\mu = -\frac{1}{5}0(\bar{1}05)$, $\theta = -10(\bar{1}01)$, $\eta = -\frac{3}{2}0(\bar{3}02)$, $V^* = -\frac{7}{5}0(\bar{7}05)$, $v = -20(\bar{2}01)$, $h = 2(221)$, $s = 1(111)$, $k = -2(\bar{2}21)$, $R = -24(\bar{2}41)$, $\lambda = -\frac{2}{3}6(2.18.3)$, $U^* = -\frac{2}{3}\,\frac{3}{2}(\bar{4}96)$.

The elements were determined afresh from three of the four crystals, the fourth crystal showing insufficient symmetry for an accurate determination. These gave average values of $e = 0.0421$, $p_o = 1.0356$, $q_o = 0.8845$, and $\mu = 87° 34' 20''$ which are in close agreement with the values in Goldschmidt's Winkel-Tabellen, which are $e = 0.0419$, $p_o = 1.0357$, $q_o = 0.8797$, and $\mu = 87° 36'$.

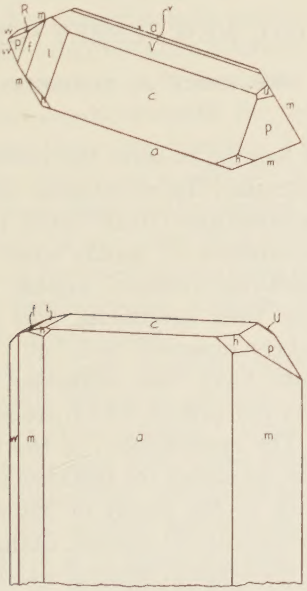

FIGURE 1.—CRYSTAL OF AZURITE FROM TSUMEB.

Crystal 1 is shown in Figure 1, as closely as possible true to nature, in plan and perspective. This crystal shows the two new forms, V and U. The form η, altho appearing on this crystal, is not shown in Figure 1, as it is too close to the form V to be properly represented in the drawing. The crystals measured varied in dimensions from 6×4×3mm. to 3×2×1mm.

The forms c, a, m, w, l, R, and p are prominent, being found on all the crystals measured, the forms σ, η, v, and h somewhat less so, being found on only three of the crystals, while the remaining forms are subordinate. The two new forms, V and U, appear only once on crystal 1, and on no other crystal.

	Symbol	ϕ	ρ
From measurements	$\mathrm{U}-\frac{2}{3}\frac{3}{2}$	25°36′	56°12′
	$\mathrm{V}-\frac{7}{5}0$	270°00′	54°43′
From calculation	$\mathrm{U}-\frac{2\ 3}{3\ 2}$	26°10′	55°48′
	$\mathrm{V}-\frac{7}{5}0$	270°00′	54°38′

Of these two new forms, the form V is thus verified, while the form U is extremely probable.

TWINNING IN THE NEW JERSEY "PSEUDOMORPHS"

FREDERICK A. CANFIELD
Dover, N. J.

WITH the view of helping to solve the problem as to what was the mineral which occupied the rectangular cavities, so abundant in the quarries at Paterson and Great Notch, the writer would call attention to the occurrence of molds which indicate that the original mineral sometimes twinned, hoping that all persons interested will examine their specimens, and perhaps find better examples than have been observed thus far.

In the molds which have been examined the narrower sides have been replaced by two planes, which are so inclined as to form re-entrant angles. The cross-section of the mold has the shape of a penetration twin, as shown for instance in Fig. 218, p. 63, in Rogers' "Introduction to the Study of Minerals." In some of the molds the replacements by quartz, filling the thin openings which formed while the original mineral was being leached away, are parallel with the longer sides of the rectangle, and midway between them, showing as is often the case in twinned crystals that the original substance was more soluble at the line of twinning than at any other place.

The specimen examined came from Paterson.

AN ELEMENTARY INTRODUCTION TO CRYSTALLOGRAPHY

J. P. WINTRINGHAM
Brooklyn, N. Y.

It is impossible to think of a person being interested in mineralogy without being interested also in crystallography. The beauty of color is at once acknowledged but the beauty of form is not much behind it, and is generally of much more importance in the determination of a mineral or a chemical compound. Yet a great many collectors of minerals will acknowledge that the subject is to them a sealed book. There seems to be a lion in the way,—one that scares a great many people in other matters as well: mathematics.

The way the subject has been presented may be to blame. In a series of articles of which this is the first I am going to try to make the matter plain to any one who will apply himself to the subject. I will confine myself mostly to four figures, 0, 1, 2 and 3, and avoid complicated mathematics entirely.

The student may want to go further than this series of essays will take him, which can be done all the more readily if he has taken pains to master these easy lessons. I have tried them with entirely satisfactory results on a number of people without the slightest previous knowledge of the subject. A young chemical student read 38 pages of my notes with evident satisfaction and was able to correct an involved clerical error in one of my symbols.[1]

The study of crystallography involves certain facts, certain conventions and certain symbols.

The facts cannot be easily described without the conventions and symbols. A little attention given to these will enable any one to get a clear idea of the matter. The symbols I am going to make use of differ somewhat from those adopted by the foremost English writers on mineralogy, the Danas and H. A. Miers. The first great fact is that crystals are bounded by flat surfaces or planes. Our endeavor is to describe these planes and the forms they build up so clearly that any one can easily imagine or realize the forms or faces referred to.

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[1] If any further errors should be detected, or the meaning is not reasonably plain at any point, I would be very much obliged to receive information about it.

If we hold a map up in front of us there is a line running north and south—up and down thru the center—which we call a meridian. This direction in a crystal we call *c*, or the *c* axis. There is also in general a straight line running east and west, from right to left, that might be the equator. In a crystal this would be *b*, or the *b* axis. Since crystals are not planes like the map, but solids, we require a third direction in space, or axis, to fully describe them. This may be represented by a long needle put through the map where the north-south line or axis crosses the east-west line or axis. This is *a* or the *a* axis.

The authors named use *a*, *b* and *c* in this way, but they also use them to indicate faces, which is confusing. Faces or planes should always be indicated by three numbers, as for instance 110 (read one, one, naught); 1 and 0 being used more frequently than all the other numbers put together. The figure 1 in the first place refers to the *a* axis and means that the plane or face passes thru the end of it nearest to the observer. The 1 in the second place means that the plane passes thru the right or east end of the b axis. We will take up the third figure, 0, later.

(*To be continued*)

In a note in *Science* (**44,** 161, Feb. 16, 1917) Professor John E. Wolff of Harvard University has given a brief account of the Hancock collection, which was referred to in our January number (**2,** 4, Jan. 1917). The late Mr. Hancock was a landscape artist and wood carver, and with an artist's eye and skilled manipulation with fine tools, developed the hidden beauties of crystals by removing the matrix.

"The collection contains about 1,600 specimens of generally the first quality, usually matrix specimens showing good crystals. The standard European and other non-American localities are fairly represented with excellent and well-chosen material but the greater interest is in the superb crystals from American localities such as Franklin Furnace, Tilly Foster mine, Amelia Court House, Va., and others where Mr. Hancock collected on the spot and then worked out his material with incredible skill and patience."

BOOK REVIEW

ELEMENTS OF MINERALOGY, CRYSTALLOGRAPHY, AND BLOWPIPE ANALYSIS. ALFRED J. MOSES AND CHARLES L. PARSONS. Columbia University and U. S. Bureau of Mines. Fifth edition, enlarged and in large part rewritten. D. Van Nostrand Co., *New York*, 1916.

In the majority of text-books of mineralogy the arrangement of the minerals is chemico-crystallographic; that is, since the acid radicals are most closely related to the crystal form, the minerals are grouped according to these radicals. Users of this method are inclined to proclaim it to be the most scientific one; but that depends on the point of view. If it is desired to consider minerals from the genetic standpoint, the usual arrangement is actually the least scientific, for it separates minerals found associated in nature, and combines those which happen to have similar crystalline forms. Arrangement according to metals is a logical necessity if the subject is to be taught primarily from the practical, economic, and genetic side. The reviewer has long felt that the latter plan is the better one, and has therefore been especially glad to learn of the appearance of a new edition of Moses and Parsons, which is unquestionably the foremost text-book arranged according to this plan.

The new edition begins with a select bibliography of mineralogy, so up-to-date that Murdoch's Opaque Minerals and Bragg's X-rays and Crystal Structure are included. Part I is devoted to Crystallography, not the old-time, theoretical treatment of the subject, but with special reference to the conditions actually found in minerals. A valuable new feature is "a simplified method of classifying and identifying real crystals by partial symmetry and angles, which enables the student after two or three lessons to recognize the crystalline system of real crystals and often to identify the species by simple measurements." This is surely preferable to basing the instruction, as is so frequently done, on the teutonically accurate but utterly unnatural wooden models. The reviewer is in hearty agreement with the authors' view that "geometrical crystallography often receives an unmerited proportion of the time devoted to the study of crystals as a natural result of the fact that the geometrical relations were first studied," which has led to their reducing the space devoted to this phase of the subject.

The excellent description of the several crystal systems of the fourth edition is repeated in the present one with but little change, but Chapter VIII, which previously bore the title "Twin crystals or macles" is now "The grouping of crystals and their imperfections," and in it crystal aggregates and the structures resulting from them, crystal habit, striations, etc., are treated in a thoroly practical way. In logical sequence there follows "An enlarged section on crystallo-optics, schemes for crushed fragments, and grouped optical distinctions consequent upon the proved value of the polarizing microscope in rapid mineral determination." Part II, on blowpipe analysis, is but little changed from the preceding edition.

In Part III, Mineralogy proper, the introductory chapters have been partially rewritten, the one on "Formation and occurrence of minerals," which was a valuable and nearly unique feature of the previous edition having been considerably enlarged. As heretofore the individual minerals are then taken up in groups, depending upon their metals rather than their crystallization, the significance of which plan was above discussed. An instructive account of the genetic relationship existing between the minerals of each group is added. Previously wolframite had been grouped with iron minerals, vanadinite with lead minerals, etc., but now these species are separately treated in "descriptions of new economic groups and species consequent on the great development in industrial applications," especially of the rarer metals. The rock-forming minerals are treated together; and whereas in former editions the gem minerals were scattered thru the several groups, they are now assembled and described in a separate chapter. The descriptions of the gem minerals are especially full, and up-to-date discussions of synthetic and imitation gems are included. The modernness of this chapter will be further evident when it is mentioned that such phenomena as indices of refraction, absorption spectra, and behavior toward X-rays are given in many cases.

Part IV, Determinative Mineralogy, has been improved over former editions by the introduction of tables based on optical properties, and by the use of keys of rather novel but eminently practical character.

The book contains a number of typographical errors; technical errors are, however, rare; in the table on p. 531 the stating of a definite value of $\gamma - \alpha$ for analcite conflicts with the description of its optical character as isotropic.

The book as a whole can be highly recommended to give a beginner a good idea of practical mineralogy.

E. T. W.

PROCEEDINGS OF SOCIETIES

THE NEW YORK MINERALOGICAL CLUB

The second regular assembly of the Club for 1917 occurred on February 14 in its usual meeting room in the American Museum of Natural History in New York, PRESIDENT J. G. MANCHESTER presiding and thirty-nine persons present.

The announced paper presented by Mr. Otto F. Pfordte, C.E., was entitled "Notes on a visit to the Mines at Cobalt, Thetford, and Sudbury, Canada."

It was very comprehensive, including reviews of the history, geology, mineralogy and industrial development of the above mentioned districts and some adjacent localities which respectively produce—silver and cobalt, gold, nickel (as pentlandite in pyrrhotite), asbestos and graphite,—and was illustrated by blackboard sketches, maps, specimens and a full series of lantern slides.

It was stated that silver had been known to occur near Cobalt since about 1879, as small nuggets were brought in by Indians from time to time, but its great deposits were first revealed by the cutting thru of a railroad in 1903.

Among the minerals described was a white earthy mixture of the arsenates of cobalt and nickel in such proportion that their red and green complementary colors exactly neutralized each other.[1]

Early and recent views of the mining camps and towns showing their rapid and extensive development concluded Mr. Pfordte's interesting paper.

WALLACE GOOLD LEVISON, *Secretary.*

THE PHILADELPHIA MINERALOGICAL SOCIETY

Wagner Free Institute of Science, February 8, 1917

PRESIDENT TRUDELL in the chair. Twelve members and fifteen visitors present.

Mr. R. J. Hagey presented a paper on "The Petrographical Microscope." The optical principles involved were thoroly treated, and illustrated with instructive diagrams. Numerous slides were exhibited by an ingenious projection apparatus designed by Mr. Hagey. Particularly good were the interference figures thus shown, and the attendant optical phenomena. The lecture was especially interesting because of the many new methods and principles introduced.

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[1] A property possessed also by other pairs of elements in the same group and utilized, as in glass making, for decolorizing their solutions.

SUNDAY, APRIL 22. Meet at 69th Street Terminal at 8.45 A. M. for trip to General Trimble's Mine and Chester Springs.

SUNDAY, MAY 6. Meet at 69th Street Terminal at 8.45 A. M. for trip to Moro Phillips Mine, Blue Hill and Sycamore Mills, Delaware Co.

SAMUEL G. GORDON, *Secretary.*

SOCIÉTÉ IMPÉRIALE RUSSE DE MINÉRALOGIE

On January 20 (7, Russian Calendar), 1917, the Imperial Russian Society of Mineralogy celebrated the one hundredth anniversary of its existence, and its history was discussed at the regular annual meeting held on that date. The officers of the society are:

President, S. A. I. Madame la Princesse Eugénie d'Oldenbourg.
Director, A. P. Karpinsky, member of the Imperial Academy of Sciences.
Secretary, A. P. Guérassimov, mining engineer.

NEW MINERALS

Griffithite, A MEMBER OF THE CHLORITE GROUP

ESPER S. LARSEN AND GEORGE STEIGER, of the U. S. Geological Survey: *Mineralogic notes. J. Wash. Acad. Sci.*, **7**, (1), 11–12, 1917.

NAME: From locality, Griffith Park, Los Angeles, California.

PHYSICAL PROPERTIES

Color: dark green. Luster: vitreous. H. about 1. Sp. Gr. 2.309. Fusibility 4, with intumescence and formation of black magnetic slag.

CRYSTALLOGRAPHIC AND OPTICAL PROPERTIES

Crystal system presumably monoclinic like other chlorites. Habit, basal plates and shreds. Cleavage, basal perfect. Optically–. Biaxial with 2V varying from 0–40°. X normal to cleavage. Birefringence strong. Pleochroism and indices varying somewhat, as follows: $\alpha = 1.485 \pm 0.01$, pale yellowish; $\beta = 1.569 \pm 0.005$, olive green; $\gamma = 1.572 \pm 0.005$, brownish green.

CHEMICAL PROPERTIES

Gelatinizes with HCl. Homogeneous material gave on analysis (by S): SiO_2 39.64, Al_2O_3 9.05, Fe_2O_3 7.32, FeO 7.83, MgO 15.80, CaO 2.93, Na_2O 0.71, K_2O none, H_2O-12.31, H_2O+4.90, TiO_2 none, sum 100.49. The formula derived is $4(Mg, Fe, Ca)O.(Al, Fe)_2O_3.5SiO_2.7H_2O$, or perhaps $H_4R_4''R'''_2Si_5O_{19}.5H_2O$.

OCCURRENCE AND PARAGENESIS

Fills amygdaloidal cavities in a basalt collected by R. T. Hill at Cahuenga Pass in Griffith Park. The amygdules are up to an inch in largest dimension and comprise a considerable part of the rock; they are pure griffithite. To be classed as a mineral of metamorphosed calcic igneous rocks.

E. T. W.

ABSTRACTS OF MINERALOGICAL LITERATURE.

PLOTTING CRYSTAL ZONES ON PAPER, (3). John M. Blake, of New Haven, Ct. *Am. J. Sci.*, [4], **42,** (6), 486–92, 1916.

A method of plotting for the purpose of bringing out zones of faces is described. It can not be briefly abstracted, but suggests in certain respects the more elaborate and significant methods of Prof. Goldschmidt.

E. T. W.

A GRADUATED SPHERE FOR THE SOLUTION OF PROBLEMS IN CRYSTAL OPTICS. Charles H. Warren of the Mass. Inst. Tech. *Am. J. Sci.*, [4], **42,** (6), 493–495, 1916.

Description of the construction of an apparatus useful in teaching as well as investigation of optical mineralogy. It consists of a specially mounted brass sphere with enameled surface, and costs $40–50 to construct. E. T. W.

THE METEORIC STONES OF LAUNTON, WARBRECCAN, CRONSTAD, DANIEL'S KUIL, KHAIRPUR, AND SOKO BANJÁ. G. T. Prior, of the British Museum (Natural History). *Mineralog. Mag.*, **18,** (83), 1–25, 1916.

Descriptions and analyses of these stones. S. G. G.

ON THE GENETIC RELATIONSHIP AND CLASSIFICATION OF METEORITES. G. T. Prior, of the British Museum (Natural History). *Mineralog. Mag.*, **18,** (83), 26–44, 1916. See *Am. Min.*, **1,** (3), 48, 1916.

THE ISOLATION OF THE DIRECTIONS—IMAGE OF SMALL OBJECTS. John W. Evans. *Mineralog. Mag.*, **18,** (83), 45–51, 1916.

A METHOD OF DETERMINING THE ANGULAR DIRECTION REPRESENTED BY A POINT IN THE DIRECTIONS—IMAGE OF AN OBJECT UNDER THE MICROSCOPE. John W. Evans. *Mineralog. Mag.*, **18,** (83), 52–57, 1916.

A BUTTERFLY—TWIN OF GYPSUM. L. J. Spencer, of the British Museum (Natural History). *Mineralog. Mag.*, **18,** (83), 82–86, 1916.

BIBLIOGRAPHY OF AUSTRALIAN MINERALOGY. C. Anderson, of the Australian Museum. *Dept. of Mines, N. S. W., Geol. Survey, Mineral Resources.* No. 22, 164 pp., 1916.

A NEWLY FOUND METEORIC STONE FROM LAKE OKECHOBEE, FLORIDA. George P. Merrill, of the U. S. National Museum. *Proc. U. S. Nat. Mus.*, **51,** 525–526, 1916.

This meteorite belongs to the class of chondritic tuffs (Cc., Brezina) or spherical chondrites. It was dredged up in the lake; the total weight of fragments is about 1,100 grams. This is the first meteorite described from Florida.

S. G. G.

HOPEITE FROM THE H. B. MINE, SALMO, B. C. T. L. WALKER, of the Royal Ontario Museum of Mineralogy. *J. Wash. Acad. Sci.*, **6**, (21), 685–688, 1916.

Hopeite occurs in solution-cavities in stalactites between the central core of spencerite and the outer zone of calamine. Crystals are usually under 3 mm. in length, altho some attain a length of 1 cm. The following forms were observed on three crystals measured (111), (133); (011), (021); (103), (101), (201); (670), (120), (5.11.0), (130), (3.11.0), (160); (010), and (100), of which (021), (670) and (3.11.0) are new. $a:b:c = 0.5703:1:0.4720$. This represents the first report of hopeite in America. S. G. G.

THE POSSIBLE ERRORS OF SILICATE ANALYSES AND A RULE OF MIXTURES FOR ALKALI-FREE ALUMINOUS AUGITES. G. TSCHERMAK. *Centr. Min. Geol.*, **1916**, (1), 1–9. E. T. W.

SYNTHESIS OF SMALTITE AND LÖLLINGITE. A. BEUTELL AND F. LORENZ, of the Univ. of Breslau. *Centr. Min. Geol.*, **1916**, (1), 10–22.

The method consists of heating a metal or treated mineral in an evacuated tube in the presence of arsenic vapor. The compounds $CoAs$, Co_2As_3, $CoAs_2$, Co_2As_5 and $CoAs_3$ were produced at different temperatures. Natural smaltite is believed to be a mixture of two or more of these substances. Löllingite is the corresponding iron mineral, and is also a mixture of similar compounds.
E. T. W.

SYNTHESIS OF NICKEL ARSENIDES. A. BEUTELL, of the University of Breslau. *Centr. Min. Geol.*, **1916**, (2), 49–56.

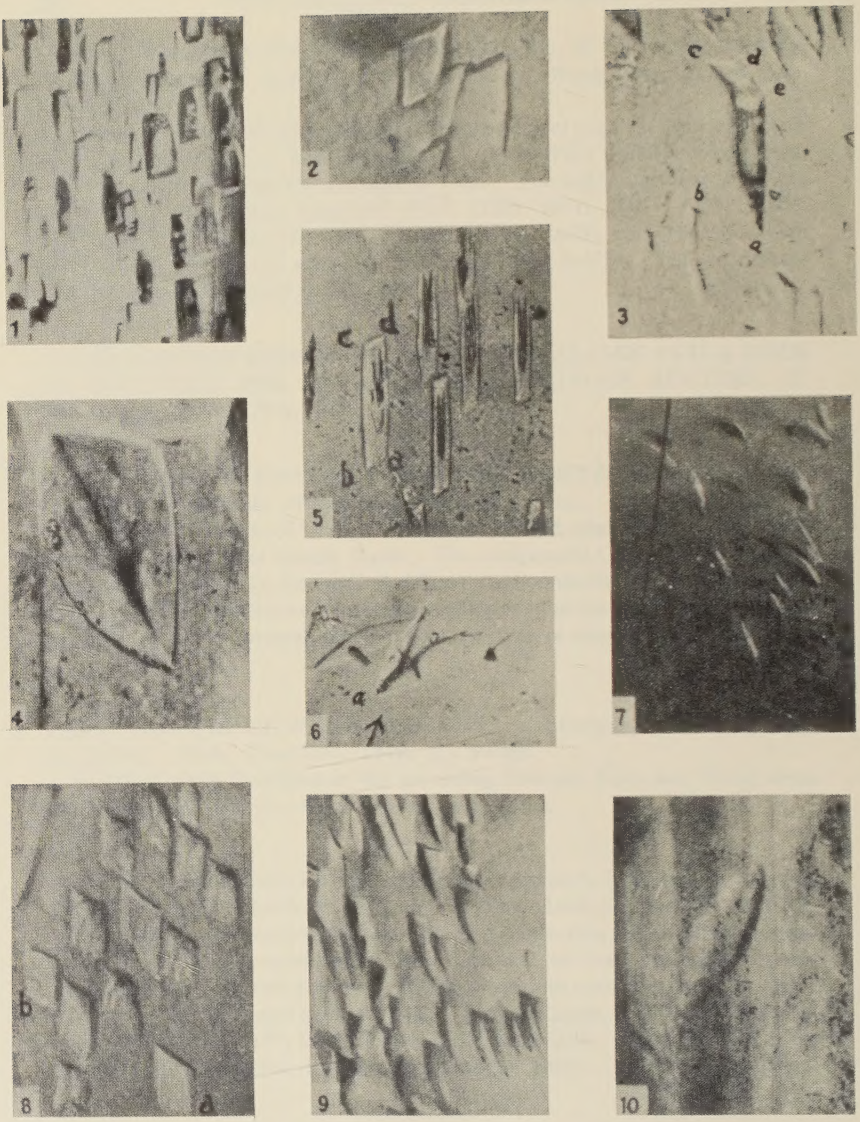
By the method described in the preceding abstract $NiAs$ and $NiAs_2$ were formed; certain minerals consist of mixtures of these. E. T. W.

MINERALOGIC NOTES [On chlorites.] ESPER S. LARSEN AND GEORGE STEIGER, of the U. S. Geological Survey. *J. Wash. Acad. Sci.* **7**, (1), 6–12, 1917.

Comprises: APHROSIDERITE FROM BRITISH COLUMBIA; THURINGITE FROM COLORADO; and GRIFFITHITE, A NEW MEMBER OF THE CHLORITE GROUP (see under new minerals above). The aphrosiderite occurs in veins in slate, and has sp. gr. 2.959 and mean *n* 1.625. Analysis shows it to have the formula $5(Mg, Fe)O.2Al_2O_3.4SiO_2.5H_2O$. The thuringite varies in color, *n*, and composition. Material analyzed had mean *n* 1.637. E. T. W.

EXCHANGE NOTICES

A. C. Bates, 320 Roseville Ave., Newark, N. J. A number of pseudomorphs of good quality offered in exchange for crystallized minerals; write for details.



Photographs by Arthur P. Honess.

ETCHING FIGURES OBTAINED ON THE PRISM FACES OF WILLEMITE

For explanation see pages 59-61
Nos. 1, 2, 3, 5, 6 and 8 are X300; 4, 7, 9 and 10 are X180

PLATE 1